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BELT FOR HIGH LOAD TRANSMISSION

(Ko Fuka Tendo yo Beruto)

Shinichi Takagi

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Inventor	:	Shinichi Takagi
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SPECIFICATION /1[1]

I. Title of the Invention

BELT FOR HIGH LOAD TRANSMISSION

II. Claims

1. A high load transmission belt disposed with plural block bodies for power transmission at an endless carrier along the longitudinal direction thereof
is characterized by providing protrusions on one surface and grooves on the other surface in two surfaces of said block bodies facing to adjacent block bodies, forming hinges by fitting the said protrusions of said block bodies to the said grooves of adjacent block bodies and making the hinges expandable and bendable.

2. A high load transmission belt according to Claim 1 wherein the protrusions of above block bodies are cylindrical-shaped protrusions, the grooves are cylindrical-shaped grooves having a cylinder radius slightly larger than that of the protrusions, and the opening part of said grooves having a cylinder radius narrower than that of protrusions, and the height of protrusions is higher than the depth of grooves.

3. A high load transmission belt according to Claim 1 wherein the surface spacing between the protrusions and the grooves are

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[1]Numbers in the margin indicate pagination in the foreign text.

roughly constant except for the vicinity of entry region of grooves contacting with the protrusions in the above hinges when the said hinges are in an expanded state.

III. Detailed Description of the Invention

(Field of Industrial Application)

This invention relates to a block connection type V belt used by hanging it on V type pulleys provided on a driving shaft and a driven shaft.

(Prior Art)

The power transmission mode of a high load transmission belt is usually classified into two transmissions: compressive trans-mission and tensile transmissions.

A belt having a structure that plural block bodies are mounted on an endless multilayer steel band in a state of bringing them into contact with each other and these block bodies are made slidable is taken for the compressive transmission, e. g., it has been disclosed in USP 4,655,73? (one number is missing, trans-lator). This transmission mode generally takes a structure of arranging the block bodies slidably on the band independent of fixing them to the band, when the belt is hanged on two driving and driven pulleys, the block bodies gather together on the slack side,

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the block bodies gathering on the slack side are pushed by the block bodies hanged on the driving pulley side to rotate the driven pulley.

On the other hand, the tensile transmission has been disclosed in USP 4,595,386, block bodies are mounted on an endless multilayer band in a state of fixing them to the band or in a non-expanded state of linking the block bodies to each other in the longitudinal direction, if the tensile side becomes a strained state and block bodies hanged on a driving pulley are moved, the block bodies located

thereafter are strained in order and transmitted by tension so as to revolve a driven pulley.

[Subject to Be Solved by the Invention]

However, in the transmission modes based on the compressive transmission or tensile transmission as described above, when a high power is transmitted, all the power is applied to tension bodies in the case of tensile transmission, therefore a limitation on the durability of belt exists; in the compressive transmission, all the power to be transmitted is applied to the compression of said block bodies, therefore a limitation on durability such as the abrasion of said block bodies still exists.

Accordingly, this invention deals with actual conditions as described above and its purpose is to enhance the durability of tension bodies or compressed block bodies by searching forms of said block bodies.

[Means for Solving the Subject]

Namely, characteristics of this invention suited to the above purpose consists in that

a high load transmission belt disposed with plural block bodies for power transmission at an endless carrier along the longitudinal direction thereof

wherein protrusions are provided on one surface and grooves on the other surface in two surfaces of said block bodies facing to adjacent block bodies, hinges are formed by fitting the said protrusions of said block bodies to the said grooves of adjacent block bodies and made expandable and bendable.

[Functions]

If the invented belt as described above is used by hanging it on pulleys, it can be smoothly hanged onto the pulleys because the above hinges are expandable and bendable, the block bodies are moved each other to become a compressed state on the slack side of belt because said hinges are formed by the fitting of said protrusions and grooves, thereby the power transmission can be made from the driving side to the driven side, on the other hand, the block bodies are mutually strained to become a tensile transmission on the tensile side of belt, the roots of protrusions become a touched state nearby the entry of grooves, thereby both the tensile transmission and the compressive transmission can be carried out at the same time, the durability of block bodies and the durability of belt are increased.

(Actual Example)

An actual example of this invention is further illustrated by reference to attached drawings.

Fig. 1 is a partial side view showing one example of a high load transmission belt relating to this invention, Fig. 2 is an A-A sectional view of Fig. 1, Fig. 3 is an oblique view of a block body used in the high load transmission belt of this invention , Fig. 4 is a schematic diagram of a belt type continuous variable-speed unit using the high load transmission belt of this invention, Fig. 5 is a diagram showing the fitted state between block bodies on the slack side of belt in Fig. 4, Fig. 6 is a diagram showing the fitted state between block bodies on the tensile side of belt in Fig. 4, and Fig. 7 is a diagram showing the fitted state in case of using other block bodies.

As shown in Fig. 1 and Fig. 2, the high load transmission belt **1** of this invention is disposed in a state of fitting them to each other along the longitudinal direction of a carrier **3** composed of an endless metal band with block bodies **2** for power transmission located on both sides in these drawings.

In the above block bodies **2**, as is evident in Fig. 3, an upper inclined plane **4** and an lower inclined plane **5** having roughly equal angles to the inclination of V grooves of pulleys are disposed on both sides, engagement grooves **6** of said carrier in a depressed shape between these two inclined planes **4**, **5** are provided, on the other hand, an upper front part **7** and an upper back part **8** become vertical planes in the front and back, a lower front part **9** and a back part **10** become inclined planes, a root part **11** protrudes in parallel forward and a protrusion **12** with a roughly circular cross-section is located by linking it therewith are equipped at the front and a groove **13** with a roughly circular cross-section which has a roughly similar shape corresponding to said protrusion **12** is equipped at the back.

The protrusion **12** of each said block body **2** is fitted to the groove **13** of another adjacent block body **2'** to form a hinge/3 **12'** and become expandable and bendable.

Then, the carrier **3** composed of one or more metal bands extending in the longitudinal direction is disposed in the both-side of said engagement grooves **6** provided at the block bodies **2**.

Moreover, when the hinges **14** constructed by the fitting of said protrusions **12** and the grooves **13** provided on said front and back sides are traveled by making the block bodies into a belt, they are a part used as a medium of tensile transmission from a block body to a

block body, therefore they are made into such a shape as not to slip in the longitudinal direction of belt when the protrusions **12** and the grooves **13** are fitted. Moreover, the cylinder radius for forming the grooves **13** is larger than the cylinder radius for forming the protrusions **12** so that these hinges are expandable and bendable in a state that the protrusions **12** and the grooves **13** are fitted to each other at the same time.

This is because the belt must be bended when it is hanged on the pulleys and the block bodies on the slack side of belt must become a sealed state for the compressive transmission to enable the combination of said tensile transmission and compressive transmission being the purpose of this invention. Accordingly, this invention takes a expandable and bendable constitution to satisfy these conditions.

The hinge **14** formed by the above adjacent block bodies **2, 2'** is further provided with edges **15, 16** which are brought into contact with the circular arc surface of said protrusion **12** in the entry region of groove **13** of said block body and, as shown in Fig. 7, the lower back **15** becomes an inclined plane of an angle θ (20 - 40°) as a modification. The surface spacing of said protrusion **12** and said groove **13** are same in this fitted state, and the protrusion **12** is smoothly compression fitted into the groove **13** even if the belt is bent at an any angle.

The invented belt is constituted as described above. Next, if the actuation of fitted state of said block bodies for enabling the combination of said tensile transmission and compressive transmission by using the above belt is illustrated, in Fig. 4, if the

high load transmission belt **1** of this invention is hanged on a driving pulley **17** and a driven pulley **18** and the belt is traveled in the arrow directions, the upper side of said belt becomes a tensile side **19** while the lower side thereof becomes a slack side **20**.

Then, in the slack side of above belt, the fitted state between the adjacent block bodies becomes a mechanism the compression state by moving the block bodies **2**, **2'** mutually as shown in Fig. 5 and becomes a mechanism in which a power is transmitted from the driving side to the driven side by maintaining it as shown in Fig. 5. In this case, the tip of protrusion **12** of said block body **2'** is brought into contact with the bottom of groove **13** of adjacent block body **2**, and a gap **a** exists between the two block bodies **2**, **2'**.

On the other hand, the fitted state between the adjacent block bodies **2**, **2'** on the tensile side of belt are strained each other to become the tensile transmission as shownin Fig. 6, the vicinity of root of protrusion **12** in one block body **2'** becomes a state of touching with the vicinity of entry of groove **13** in the other block body **2**, and a gap **b** is formed between the two block bodies **2**, **2'**. In this case, the gap **b** is usually bigger than the gap **a**.

Now, if the width of block **2'** alone in the longitudinal direction is taken as w, the length of metal band in the part hanged on pulleys as l_p, the length of metal band in the part on the tensile side as l_t and the length of metal band in the part on the slack side as l_s, the length L of whole metal band is

$$L = l_p + l_t + l_s$$

Accordingly, if the numbers of blocks on the part hanged on the pulleys, the part on the tensile side and the part on the slack side are expressed by PN, TN, SN, respectively,

$$PN = l_p/(w + b - a)$$

$$TN = l_t/(w + a)$$

$$SN = l_s/(w + b)$$

Both the tensile transmission and the compressive transmission can be carried out at the same time by satisfying these conditions.

[Effects of the Invention]

in a high load transmission belt provided with block bodies in the longitudinal direction of a carrier as described above, this invention enables to carry out the compression transmission on the slack side of belt and the tensile transmission on the tensile side of belt at the same time and perform the power transmission in good efficiency because adjacent block bodies are made into hinges /4

to become expandable and bendable by fitting protrusions and grooves, thereby, as compared with a conventional belt having a compressive transmission mechanism only or a tensile transmission mechanism only, this invention also disperses the tension stress and compres-sion stress applied to the belt and enhances the durability of block bodies and the durability of belt in case same power is transmitted because of good transmission efficiency.

Moreover, this invention improves the expandability and bendability, smooths the above tensile transmission and compressive transmission as well as takes actual effects to make the power transmission more efficient by applying the fitting structures of protrusions and grooves described in Claim 2 or 3.

IV. Brief Description of the Drawings

Fig. 1 is partial side view showing one example of high load transmission belt relating to this invention, Fig. 2 is A-A sectional view of Fig. 1, Fig. 3 is oblique view of block body used in high load transmission belt of this invention, Fig. 4 is schematic diagram of belt type continuous variable-speed unit using high load transmission belt of this invention, Fig. 5 is diagram showing fitted state between block bodies on slack side of belt in Fig. 4, Fig. 6 is diagram showing fitted state between block bodies on tensile side of belt in Fig. 4, and Fig. 7 is diagram showing fitted state in case of using other block bodies.

1 ... high load transmission belt

2,2' ... block bodies

3 ... carrier

12 ... protrusion

13 ... groove

14 ... hinge

19 ... tensile side of belt

20 ... slack side of belt